



INSTRUCTIONS

MECHANICAL EQUIPMENT

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INTRODUCTION

This section covers the mechanical equipment and vendor equipment, such as the cab heater, on Series-7 Locomotives. It should be noted that variations in equipment will exist between different models of locomotives and between railroad customers.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.

SHAFT ALIGNMENT

DIESEL ENGINE DRIVEN ACCESSORIES

Description

The following instructions cover the alignment of the equipment blower, the air compressor, the radiator-fan gear unit and their respective driveshafts, Fig. V-1.

Shafts become misaligned as a result of many natural and unavoidable causes. Heat, vibration, bearing wear and settling of foundations or bases all tend to alter initial alignment.

In general, coupling life is increased when shafts are carefully aligned. If this is not done and a coupling is heavily stressed due to unnecessary torque or other forces, it will have little reserve to accommodate misalignment stresses and probably will not provide the length of service intended.

During alignment, there are two measurements to be checked: parallel and angular alignment, Fig. V-2. If the sub-bases have not been damaged, the positioning dowels serve to maintain the correct horizontal alignment.

Engine to Air Compressor Driveshaft

Removal

1. Drain the oil back from the filter to the engine free-end cover.
2. Disconnect wiring and remove the HOTS and LOTS temperature switches.

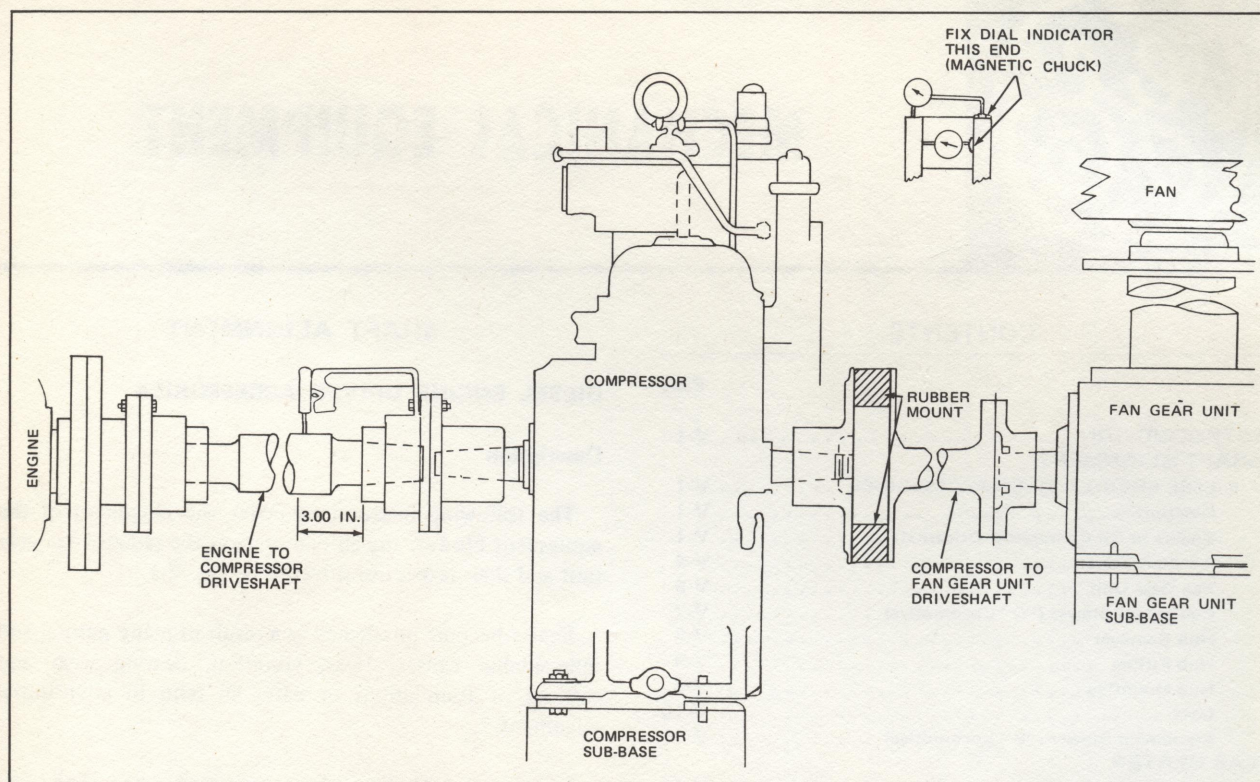


FIG. V-1. ENGINE, COMPRESSOR AND FAN GEAR UNIT ARRANGEMENT.

3. Remove long shaft guard, Fig. V-3, from engine to compressor compartment bulkhead. Remove guard, Fig. V-4, over compressor coupling, in the compressor compartment.
4. Working through the summer/winter door in the clean air chamber, place blocking under the compressor driveshaft to prevent it from dropping when the coupling at the compressor is separated. Also block the shaft at the engine coupling, Figs. V-5 and V-6.

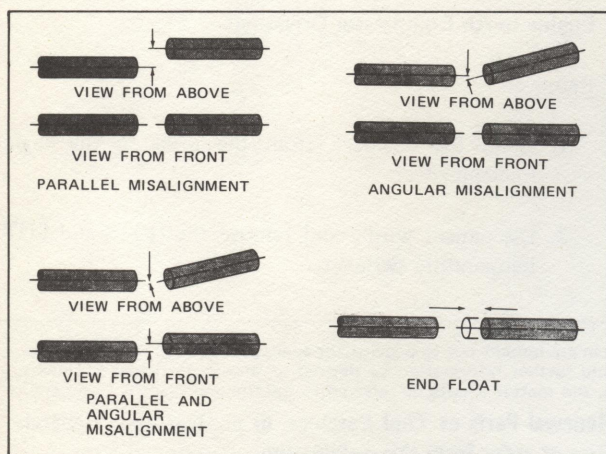


FIG. V-2. COUPLING MISALIGNMENT.

5. Locate a receptacle under each coupling to catch the grease that will flow out when the coupling sleeves are separated, then separate the sleeves.
6. Using manpower, slide the driveshaft forward (toward the engine) and to the side of the unit, until it has been moved out far enough to be picked up by a crane with sling. Approximate weight of the complete shaft is 350 lb.

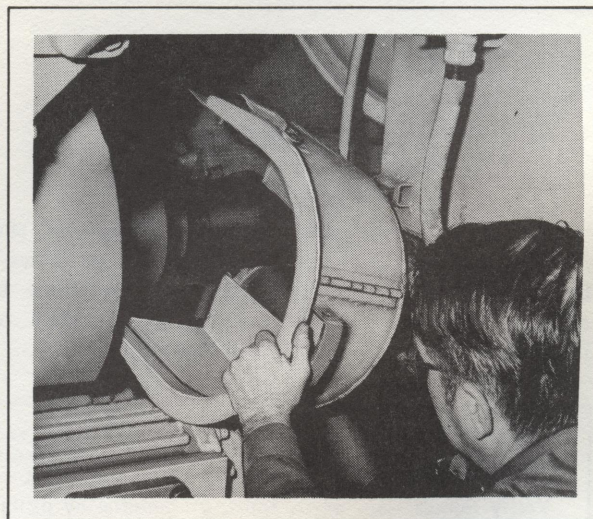


FIG. V-3. LONG SHAFT ENGINE TO COMPRESSOR GUARD.

FIG. V-1, E-24233A

FIG. V-2, E-24234

FIG. V-3, E-24235

FIG. V-4, E-24236

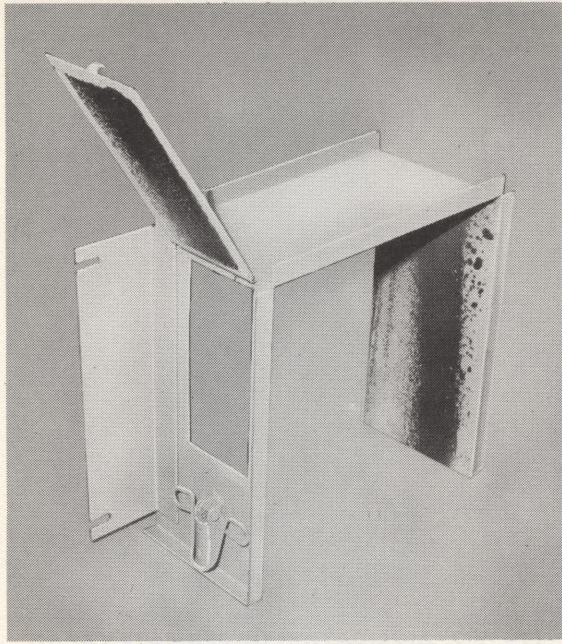


FIG. V-4. GUARD OVER COMPRESSOR COUPLING.

7. Set shaft on the floor on blocks where it is protected and repairs may be made if necessary.

Installation and Alignment

1. Apply a 0.062-in. bead of Permatex* circumferentially on the flange faces within the bolt circle on both couplings; Fig. V-7.

FIG. V-5, E-24238

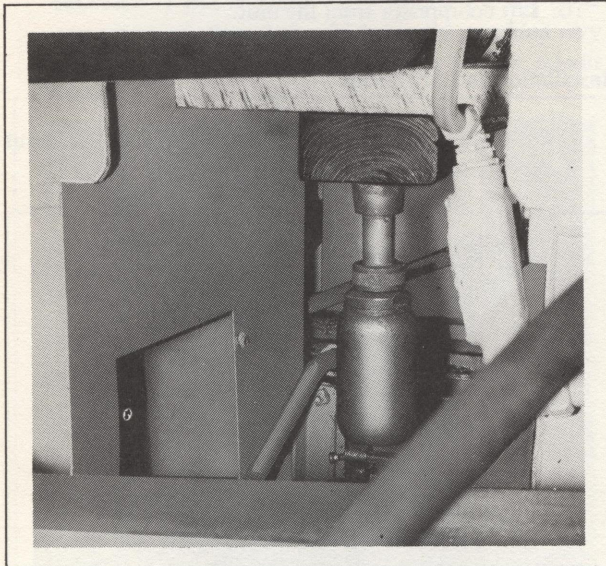


FIG. V-5. BLOCKING LONG SHAFT AT COMPRESSOR END.

*Product of Permatex Co., Inc.

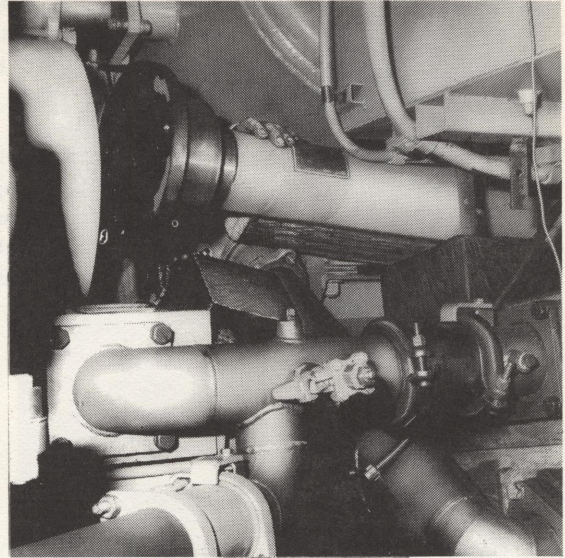


FIG. V-6. BLOCKING LONG SHAFT AT ENGINE END.

2. Lift shaft with crane and insert shaft into unit as far as possible. Remove sling.

NOTE: Care should be taken to keep from catching the hub flange on any obstacle which will cause the flange or sleeve to slide off the hub, at the compressor end. Several layers of electrician's tape, wrapped around the hub, might prevent this from happening.

3. Again using manpower, slide shaft into the proper position to connect the couplings.

CAUTION: Extreme care must be exercised when installing the driveshaft, to prevent damage to the finished surface (O-ring surface) of the flexible-coupling gear hubs. Do not allow the teeth of the sleeve assembly of the flexible coupling to contact the finished surface of the gear hub. If the surface is damaged, the finish may be restored by cleaning with NALCO* and then silver-soldering the scratches, using flux and an acetylene torch, followed by polishing the surface with 150-grit emery cloth (for contour) and crocus cloth (for finish). If the scratches are very shallow (several thousandths), they may be removed by polishing the surface with crocus cloth, omitting the silver-soldering operation.

4. Install the flange bolts, omitting one at each end, and torque bolts with 280-310 lb.-ft. torque.

*Product of NALCO Chemical Co.

5. Mount an indicator on the engine and compressor coupling flanges, utilizing the empty bolt hole. Rotate the shaft 360 degrees and indicate. Total indicated runout, taken 3 in. from hub, is to be within 0.050 in., Figs. V-1, V-8 and V-9.
6. Remove indicators; insert and torque final bolt. Lubricate coupling by turning shaft until pipe plugs are horizontal, then remove both plugs. Insert grease fitting in one hole and pump GE-D50E21 grease into coupling until it comes out other hole. Remove grease fitting and reinstall pipe plugs.

Air Compressor

Removal

1. Drain water and oil from compressor.
2. Disconnect all piping (water, oil and air) and remove air intake filter housing and filters.
3. Remove guard over the engine-to-compressor driveshaft and coupling, and the guard over and the oil pan under the fan gear unit coupling and driveshaft.
4. Remove bulkhead between the air compressor chamber and the fan gear-unit chamber. Also remove the door post that supports this bulkhead on the left side of the unit. Remove section of handrail in this immediate area, Fig. V-10.
5. Working through the summer/winter door in the clean air chamber, place blocking under the compressor driveshaft to support it when the coupling at the compressor is separated, Fig. V-5.
6. Support the compressor to fan gear-unit coupling shaft, using a light chain, sling or rope between the shaft and the wire grill above it, Fig. V-11.
7. Separate both couplings. Protect the rubber donuts of the fan gear-unit coupling from oil and dirt, and place receptacle under compressor coupling to catch the grease that will flow out when the coupling is separated, Fig. V-12.
8. Remove compressor mounting bolts, shims and dowels. Dowel can be removed by putting several washers on the pin between the compressor foot and the dowel nut and tightening the nut down until dowel releases. Mark shims when removing them so they can be reassembled in their original positions when the compressor is reinstalled.

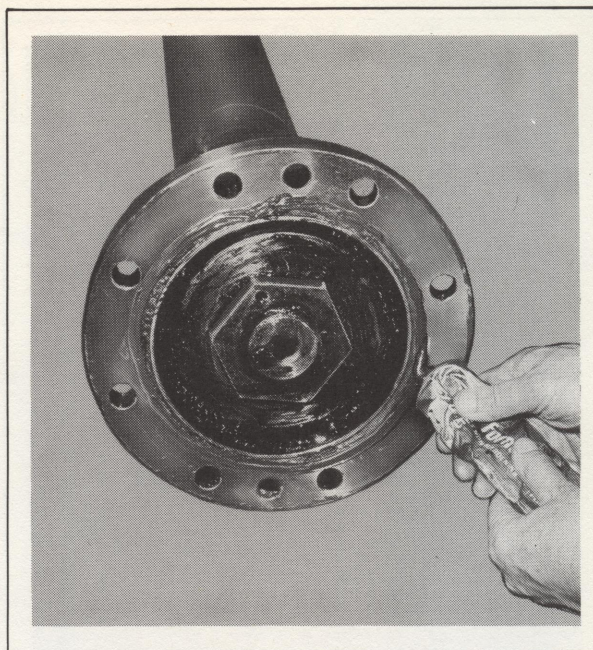


FIG. V-7. APPLICATION OF PERMATEx BEAD ON FLANGE.

9. Slide the compressor on its mounting base to the side of the unit from which it is to be removed. Blocking must be placed adjacent to the mounting base and extended out on the walkway far enough that an overhead crane hook and cable will clear the radiator overhang and be hooked into the lifting eye on the compressor.

10. Lift compressor from the unit.

Installation and Alignment

1. Shrink the coupling hub onto the compressor input shaft (see "Hub Mounting" section).

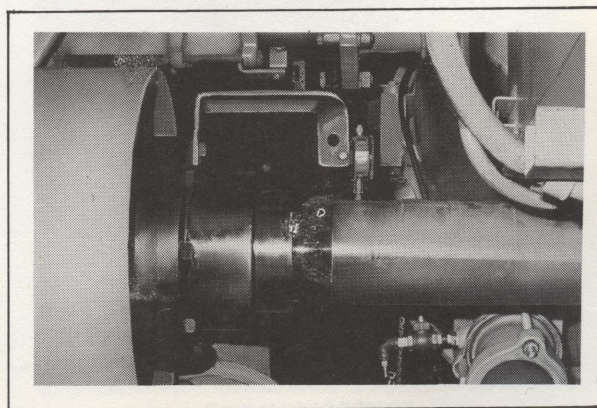


FIG. V-8. INDICATOR MOUNTED ON ENGINE COUPLING.

FIG. V-7, E-24239

FIG. V-8, E-24240

FIG. V-9, E-24241

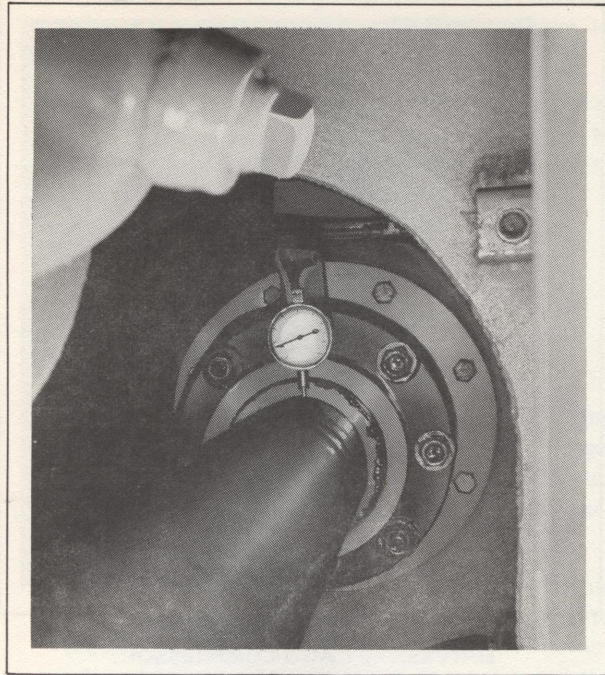


FIG. V-9. INDICATOR MOUNTED ON COMPRESSOR COUPLING.

2. Mount the compressor on its sub-base and, if replacing same machine, align the dowel holes located on each side of the compressor with those in the sub-base. All shims which were removed during the compressor removal must be reinstalled in their original positions.

NOTE: If the machine being installed is the same one removed, Step 2 should bring the machine very close to the original alignment. If a new or rebuilt

FIG. V-11, E-24243

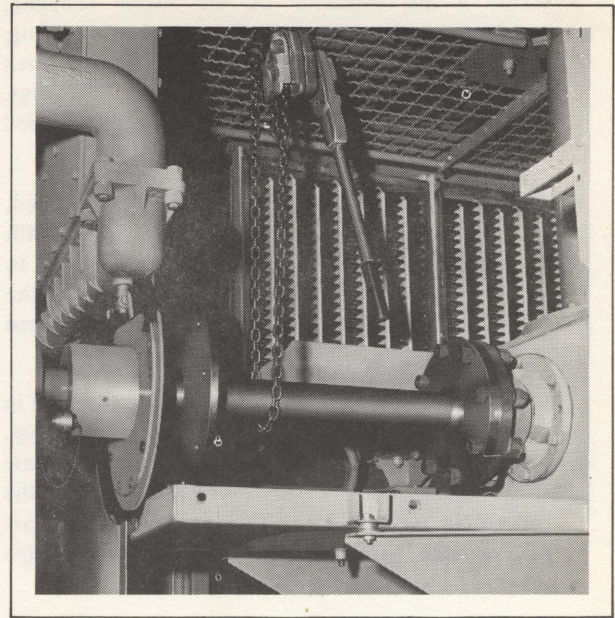


FIG. V-11. SUPPORTING FAN GEAR-UNIT SHAFT.

compressor is being installed, shims may have to be added, or some of the original shims removed, to obtain proper alignment. Also, the dowel holes may require plugging before redrilling.

3. Place the compressor driveshaft coupling into position for assembly to compressor coupling.
4. Lubricate threads of flange bolts with Molykote GN* and install in coupling. Torque bolts to 280-310 lb.-ft.

FIG. V-12, E-24244

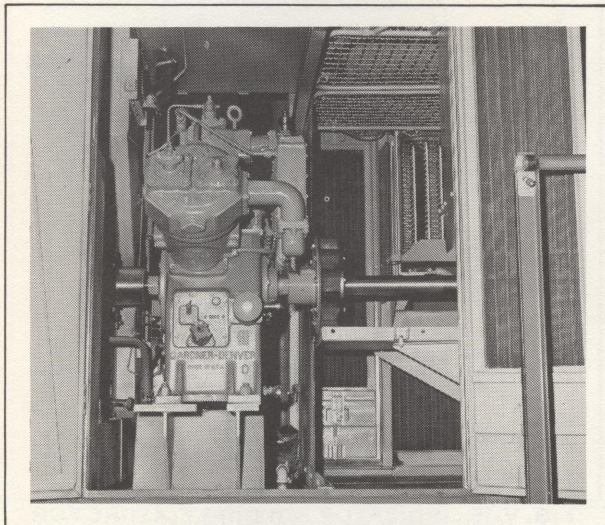


FIG. V-10. VIEW WITH BULKHEAD, DOOR POST AND HANDRAIL REMOVED.

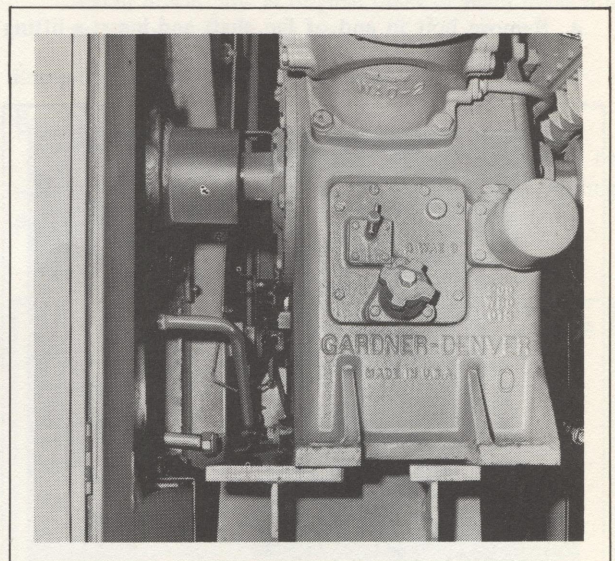


FIG. V-12. LOCATION OF RECEPTACLE TO CATCH GREASE.

*Product of Alpha Molykote Corp., Div. of Dow-Corning (GE Part 147X1143-1).

5. Install a dial indicator on the engine coupling, Fig. V-13, and one on the compressor coupling, Fig. V-14, to indicate on the shaft 3 in. from each hub. Rotate shaft 360 degrees and read total runout. Total runout, with full fuel tank, should not exceed 0.050 in. Refer to Fig. V-15 for fixture.
6. When the runout noted in Step 5 has been obtained, lubricate the threads of the compressor bolts with Molykote GN. Install the bolts and tighten them to 400-450 lb.-ft. torque. Insert dowel pins in the original holes, if aligned, or ream and install oversized dowels.
7. Rotate shaft until grease plugs opposite each other in the coupling are horizontal. Remove both plugs. Install grease fitting in one hole and insert grease (GE-D50E21) into coupling until it comes out the other hole. Remove grease fitting. Apply liberal coat of Permatex to pipe plug threads and install pipe plugs.

Fan Gear Unit

Removal

1. Remove the radiator compartment hatch and radiators.
2. Disconnect the gear unit coupling.
3. Remove mounting bolts, dowels and shims. Mark shims so they can be reinstalled in their original positions.
4. Remove bolt in end of fan shaft and insert a lifting eye bolt.

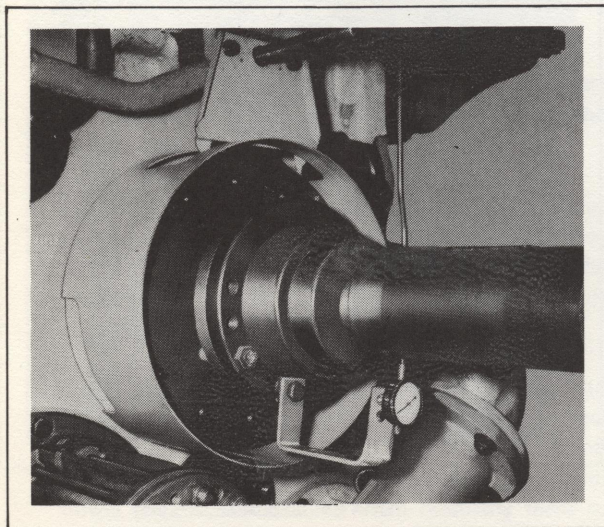


FIG. V-13. CHECKING ALIGNMENT BETWEEN DRIVESHAFT AND DIESEL ENGINE.

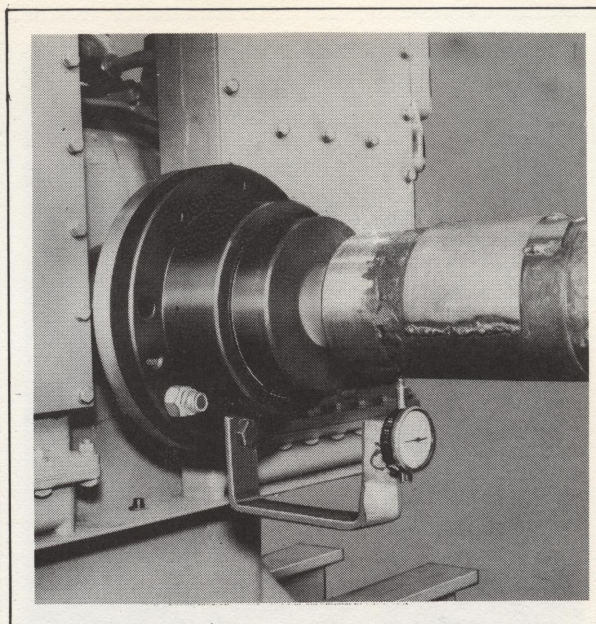


FIG. V-14. CHECKING ALIGNMENT BETWEEN DRIVESHAFT AND COMPRESSOR.

5. Lift the unit vertically. Make sure the fan does not catch on the shroud.

Installation and Alignment

NOTE: Do not attempt to align the fan gear unit with the air compressor without first obtaining the proper alignment between the engine and compressor. When the correct compressor alignment has been achieved, proceed as follows.

1. Shrink hub on the fan gear-unit shaft and on compressor output shaft (see "Hub Mounting" section).

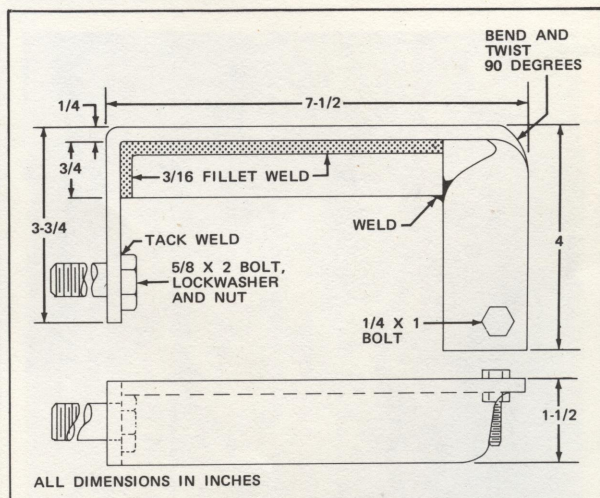


FIG. V-15. INDICATOR HOLDING FIXTURE FOR ALIGNING THE ENGINE TO COMPRESSOR DRIVESHAFT.

FIG. V-13, E-13513

FIG. V-14, E-13514

FIG. V-15, E-24554

2. Install driveshaft to fan gear-unit shaft hub. Lubricate bolt threads with Molykote GN and tighten to 280-310 lb.-ft. torque.
3. Mount fan gear unit on its sub-base. Replace shims as they were prior to removal. Maintain 3.000 to 3.030 in. between hubs and 3/8 in. between ends of fan blades and fan shroud opening.

NOTE: If the unit being installed is the same one removed, Step 3 should bring the unit very close to the original alignment. If a new or rebuilt unit is being installed, the shims may have to be adjusted to obtain proper alignment.

4. Mount an indicator on the large compressor coupling flange and indicate the O.D. of the gear-unit flange. Rotate fan gear-unit flange and check total runout. Total indicated runout should not exceed 0.010 in., Figs. V-16 and V-17.
5. Clean out the bolt hole in the rubber mounts (mounting sandwich). Use the correct length bolt (to prevent bottoming of the bolt and pulling out the nut when tightening the mounting bolts) and install the rubber mounts. Lubricate the bolt threads with Lubriplate* and tighten to 28-30 lb.-ft. torque.

NOTE: When tightening bolts, avoid twisting the rubber mounts. Molded lines on the mounts should be visibly straight after tightening. Do not over-torque. Reassemble any rubber mount that shows greater than 3 degrees (0.08 in.) twist in either direction after assembly, Fig. V-18.

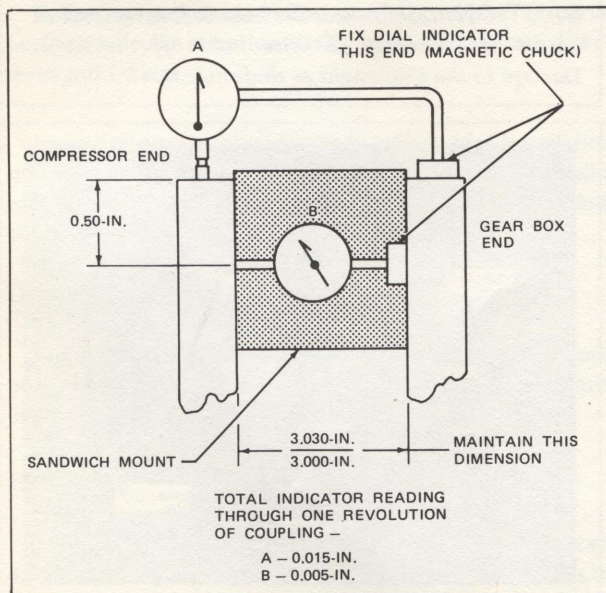


FIG. V-16. INDICATOR MOUNTING.

*Product of Fiske Bros. Refining Co. (GE Part 147X1614).

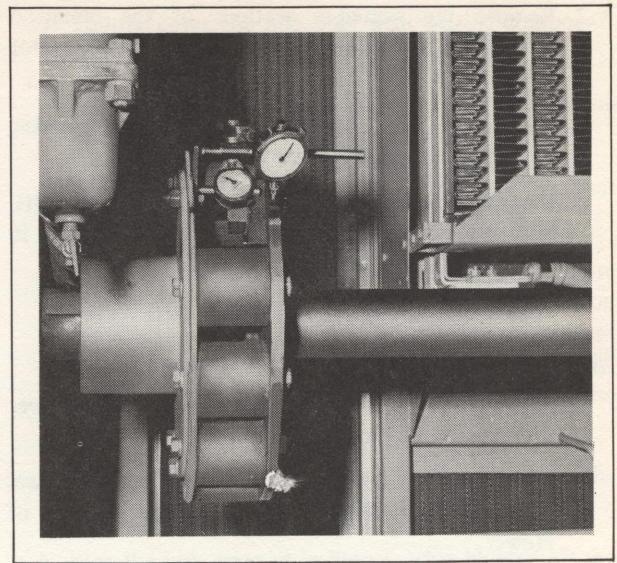


FIG. V-17. CHECKING ALIGNMENT BETWEEN COMPRESSOR AND FAN GEAR UNIT.

6. Mount indicators as shown in Figs. V-17 and V-18. Rotate the fan shaft 360 degrees to check parallel and angular alignment. Total parallel indicator reading should be within 0.015 in. Total angular indicator reading should be within 0.005 in.

NOTE: To reduce compressor torque, pressurize compressor unloader valves.

7. After obtaining the proper alignment, bolt down the fan gear unit, using Lubriplate on the mounting bolt threads and tightening bolts to 200-250 lb.-ft. torque. Install dowel pins in original holes or ream holes and install oversized dowel pins.

Equipment Blower ("C" Locomotive)

Removal

At prescribed intervals, the equipment blower must be removed to inspect the bearings. Use the following procedure:

1. Remove blower hatch.

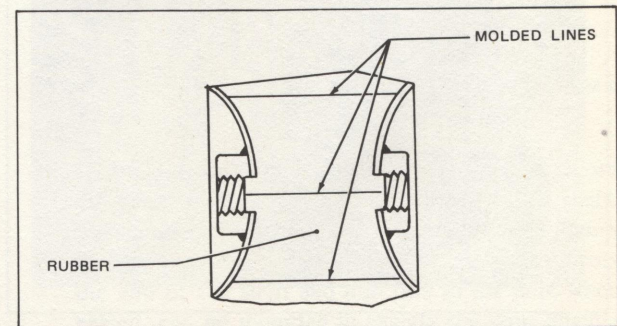


FIG. V-18. CROSS-SECTION OF RUBBER MOUNT (MOUNTING SANDWICH).

2. Remove the bolted-in sections of the bulkhead around the blower drive coupling from the generator compartment.
3. Disconnect the flexible coupling by removing two bolts at each end of the coupling, Fig. V-18.
4. Remove the dowel pins and blower mounting bolts. Mark and save shims, since they must be replaced in their original positions upon reinstallation.
5. Insert the lifting eye and lift the blower.

Installation and Alignment

1. Shrink hubs onto power take-off shaft and blower shaft (see "Hub Mounting" section).
2. Mount blower on its sub-base, aligning the dowel holes. Replace shims removed during removal of blower.

NOTE: *If the blower being installed is the same one removed, Step 2 should bring the blower close to the original alignment. If a new or rebuilt blower is being installed, shims may have to be adjusted to obtain proper alignment.*

3. The coupling must be disassembled for installation. Remove two bolts on both ends which secure the coupling flange and flex-pack to the coupling hub, Fig. V-19. Bolt these flanges into the blower and power take-off hubs. Torque flange mounting bolts to 30-35 lb.-ft. torque.
4. Clean bolt, nut and hub threads with a safety solvent, and wipe dry. Apply Loctite Sealant* to bolts which screw into flanges. Assemble bolts and immediately torque the four (4) bolts at each end of coupling to 115-120 lb.-ft.

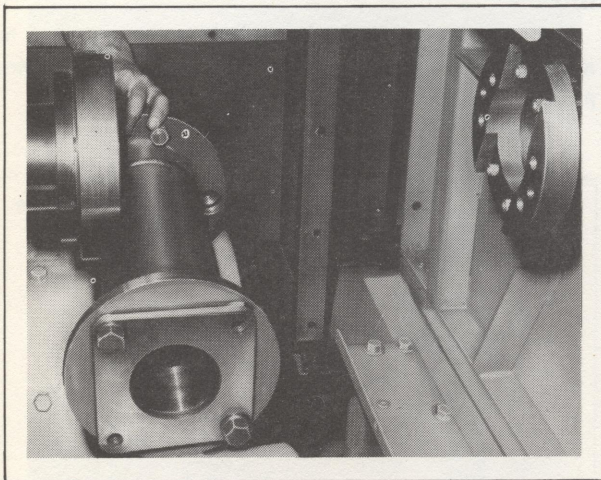


FIG. V-19. BLOWER COUPLING REMOVED.

*Product of Loctite Corp.

5. Mount an indicator on each hub to indicate 5 in. out on shaft at each end, Fig. V-20. Adjust shims under blower until total indicated runout is within 0.020 in. with a full fuel tank. See Fig. V-21 for fixture.
6. When proper alignment is obtained, bolt down blower, using Lubriplate on the bolt threads and tighten bolts to 200 lb.-ft. torque. Install dowel pins in original holes if aligned, or ream holes and install oversized dowel pins.
7. Replace any guards which had to be removed to facilitate removing the blower.

Hub Removal

Using a Hydraulic Pump

Coupling hubs may be removed by the "pop-off" or float method, using hydraulic pressure for quick removal. Steps 1 through 5 may be used to remove all hubs where shaft ends are properly prepared. See Tool Catalog for proper tooling. (Use the same hydraulic pump and adapter employed to float a traction motor pinion.)

1. If a locking nut is assembled on the end of the shaft, loosen the set screw or screws and back off nut 1/4 to 1/2 turn, to act as a back-up plate when the hub pops off.
2. Insert the adapter into the threaded hole in the center of the shaft, and connect it with tubing to the hydraulic pump.

CAUTION: *Do not heat the hubs before removal or use a steel hammer to drive hubs off the shaft. Damage to the equipment or shaft may result.*

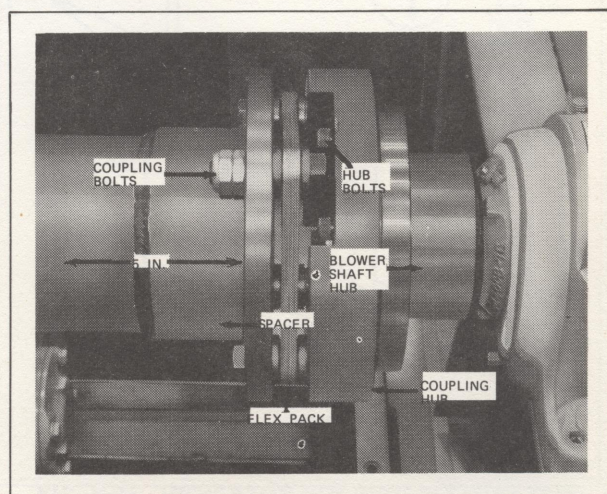


FIG. V-20. EQUIPMENT BLOWER FLEXIBLE COUPLING.

FIG. V-19, E-24246

FIG. V-20, E-24247A

FIG. V-21, E-24555

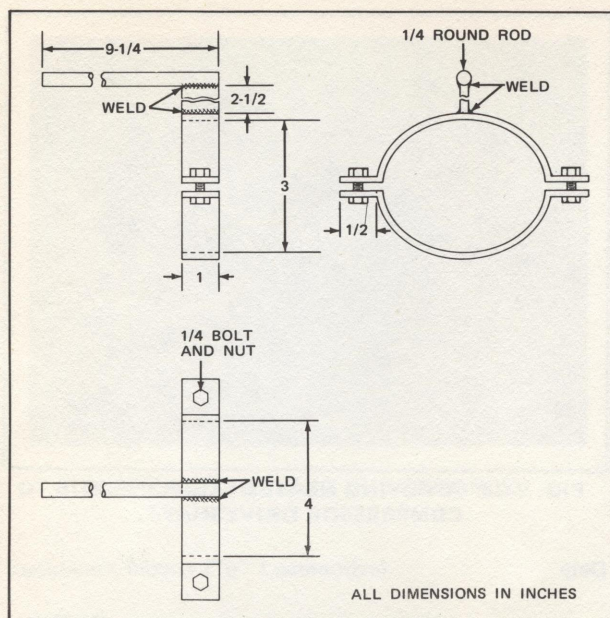


FIG. V-21. INDICATOR HOLDING FIXTURE FOR ALIGNING EQUIPMENT BLOWER WITH POWER TAKE-OFF SHAFT.

3. Pump up enough pressure to force oil into the shaft groove. Ten to twenty strokes is normally sufficient for hub removal.
4. Remove pump assembly from the shaft.
5. Remove nut and slide the hub off the shaft.

Following hub disassembly, carefully inspect all parts, paying particular attention to the internal and external gear teeth and O-rings.

Excessive wear of the gear teeth will require installation of new parts. If the hub or sleeve must be renewed, install a new hub and sleeve as a pair. Do not mate a new gear hub with a worn sleeve, or vice versa.

Using a Mechanical Puller

The hubs on equipment having shaft ends which are not prepared for the hydraulic float method must be removed using a hub puller tool.

Hub Fitting

To prevent the hub from slipping, it should have at least a 75 percent fit on the shaft; that is, at least 75 percent of the tapered bore of the hub is to contact the tapered fit on the shaft. Before heating a hub for mounting, check and correct the fit as follows:

1. Lightly cover the hub bore with blueing compound, such as Prussian blue oil pigment.
2. Snap the cold hub on the shaft. Do not twist the hub after it is in place.
3. Mark the relative position of the hub on the shaft with chalk, then remove the hub.
4. Inspect the taper fit on the shaft; blueing of hub bore should have transferred to and should now show on the shaft. If at least 75 percent of the shaft surface shows traces of blueing, the fit is satisfactory. If, however, only a few spots of blueing show on the shaft, the fit is insufficient.
5. Where necessary, dress down the blue spots on the shaft very lightly, using an emery cloth.
6. Blue the hub again as in Step 1, wipe blueing off the shaft end, and repeat Steps 2, 3 and 5. Be careful to place the hub on the shaft in the same position as indicated by the chalk marks.

The fit generally will be improved, but the procedure given in Steps 1 thru 6 may have to be repeated several times.

CAUTION: Under no circumstances use a lapping compound, since lapping will produce a shoulder at the large end of the tapered fit. This shoulder will prevent a perfect fit when the hub is mounted hot in the advanced position.

Hub Mounting

Proper hub mounting is essential for successful operation of the coupling. Proceed as follows:

1. Thoroughly clean the hub fit on the shaft and the bore of the hub.
- NOTE:** Do not use kerosene or other cleaner which will leave an oil film.
2. Remove any scarring on the shaft or hub bore.
3. Spot the cold hub on the shaft by hand, and check for 75-percent fit (see "Hub Fitting" section).
4. Trial-mount the hub on the shaft. Measure and record the position of the hub with respect to the shaft. Make measurements with a micrometer or a pinion advance gage. Mark the points of measurement across the end of the shaft and hub face so the hub, when heated, can be mounted in exactly the same angular position and the advance measurement can be made from the same points.

5. Heat the hub in an oven until the entire hub has reached a uniform temperature, as specified in the "Data" section.

Some accurate method must be used to measure the hub and shaft temperatures quickly before mounting the hub. This can be done best with a pyrometer (see Tool Catalog), Fig. V-22. Measure the temperature of the shaft and hub with the same instrument.

6. Quickly mount the hot hub on the shaft in the same angular position as when cold, using the chalk marks as a guide. When the hub is ready for engagement with the taper fit (not in actual contact), snap it forcibly into place with a quick push. It is important that the hub be instantly snapped into position before it has cooled appreciably; otherwise, it will "freeze" to the shaft and will not be further adjustable. Fig. V-23 shows the hub being mounted on the shaft.

NOTE: The coupling sleeve and O-ring seals must be placed over the shaft before the hubs are installed.

7. Check the "hot" (or shrunk-on) position of the hub on the shaft with a gage, located in the same relative position as used to measure the position before hub was heated.

Proper advance is shown in the "Data" section. If the advance is not within the limits given, remove the hub and repeat the procedure. Fig. V-24 shows the hub advance being checked.

Insufficient advance can result from not "soaking" hub at elevated temperature for sufficient time or not having temperature high enough. Remember the temperature shown in the "Data" section is the difference that oven should be above shaft temperature. Insufficient advance can cause a slipped coupling.

Less often achieved, but just as great a problem, is the case of over-advancement. This can cause cracked hubs and resulting failure.

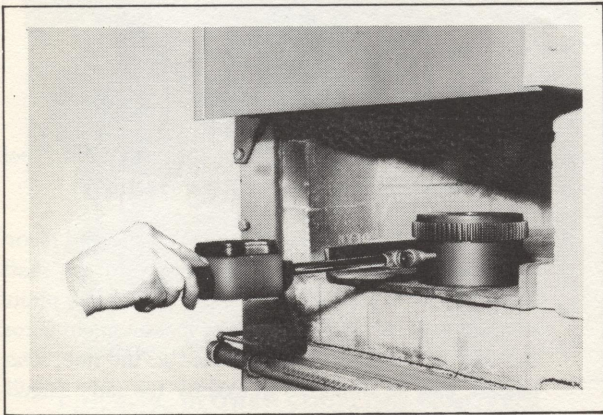


FIG. V-22. USING PYROMETER TO CHECK HUB TEMPERATURE.

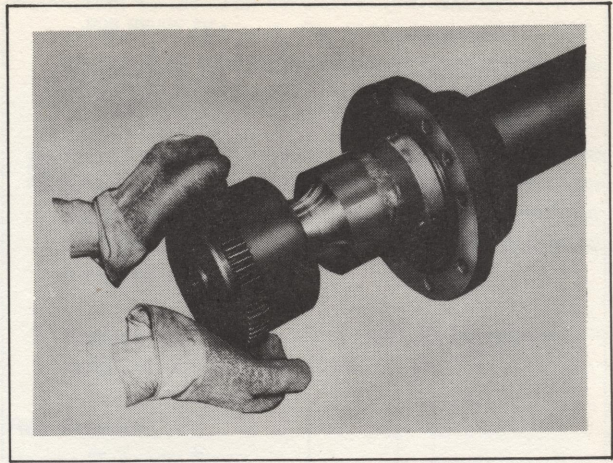


FIG. V-23. APPLYING HEATED COUPLING HUB TO COMPRESSOR DRIVESHAFT.

Data

		To Mating
Hub To Shaft Contact Fit		Part
Compressor Driveshaft Hubs	75%	
Compressor Input and Output Hub	75%	
Fan Gear-Unit Hub	75%	
Blower Hub	75%	
Power Take-Off Shaft Hub	75%	
<u>Temperature (Degrees Above Shaft Temperature)</u>		
<u>Required For Proper Hub Advance</u>		
	Advance (in.)	Temp.
Compressor Driveshaft Hubs . . .	0.035 to 0.040	214 F
Compressor Input Hub	0.035 to 0.040	235 F
Compressor Output Hub	0.030 to 0.035	212 F
Fan Gear-Unit Hub	0.035 to 0.040	235 F
Blower Hub	0.050 to 0.055	350 F
Power Take-Off Hub	0.040 to 0.045	275 F
<u>Engine To Compressor Alignment</u>		
<u>(With Fuel Tanks Full) (in.)</u>		
Total Runout (3 in. From Hubs)	0.050	
End-Play	Free to 0.500	
<u>Compressor To Fan Gear-Unit Alignment (in.)</u>		
Parallel Alignment Runout	0.015	
Angular Alignment (2-1/2-in. Radius From Centerline)	0.010	
<u>Blower Alignment (With Full Fuel Tanks)</u>		
Total Runout (in.)	0.050	
<u>Torque Values (lb.-ft)</u>		
Compressor Driveshaft Coupling Flange Bolts . . .	280-310	
Rubber-Sandwich Mounting Bolts	28-30	
Blower Coupling Flange Mounting Bolts	30-35	
Blower Coupling Flange Bolts	80	
Compressor Mounting Bolts	400-450	
Fan Gear-Unit Drive Flange Bolts	280-310	
Fan Gear-Unit Mounting Bolts	200-250	
Equipment Blower Mounting Bolts	200	

FIG. V-22, E-25401

FIG. V-23, E-25402

FIG. V-24, E-13520

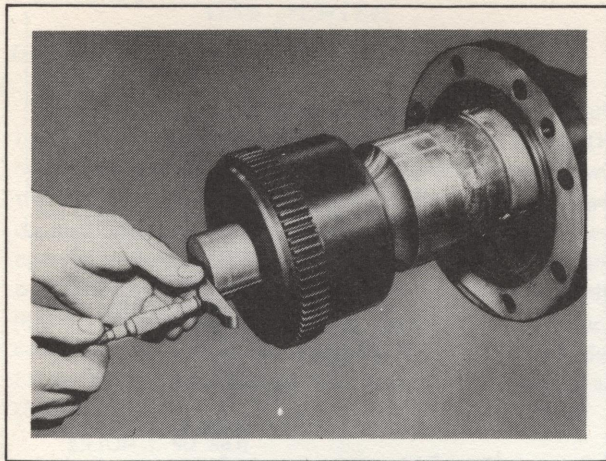


FIG. V-24. CHECKING HUB ADVANCE.

FIG. V-25, E-24583

Equipment Blower ("B" Locomotive)

NOTE: The equipment blower on a "B" locomotive is located in the radiator compartment. The rotor of the blower is mounted on the stub shaft of the fan gear unit. Since the fan gear unit is driven by the diesel engine, the blower will operate whenever the engine is running.

Therefore, since the rotor is mounted on the stub shaft of the fan gear unit, a "shaft alignment" procedure is not necessary.

Removal

If, for any reason, the removal of the fan gear unit (Figs. V-25 and V-26) is required, the rotor must be removed from the fan gear-unit shaft, and the blower housing must be slid to the rear of the radiator cab. To do so, proceed as follows:

1. Remove the six (6) bolts holding the inlet guard in place and remove guard.
2. Remove the sixteen (16) nuts holding the inlet cone to the housing and remove cone.
3. Remove rotor as follows:
 - a. Remove the two (2) allen-head mounting screws.
 - b. Insert one of the screws in the jacking (removal) hole, and torque down. If bushing does not loosen, tap on rotor hub while applying torque to screw.
 - c. Slide rotor from stub shaft and housing.

FIG. V-26, E-16160

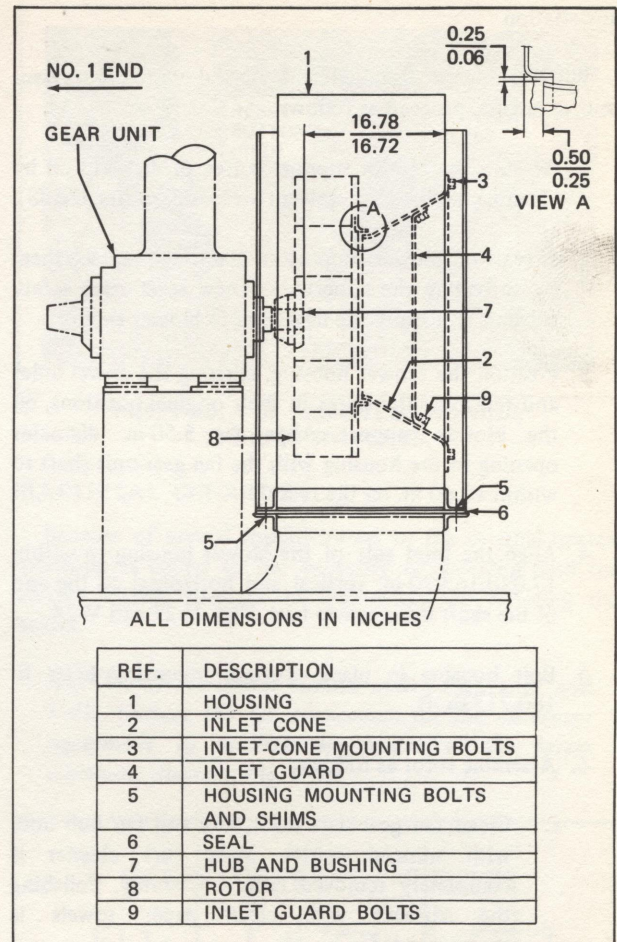


FIG. V-25. EQUIPMENT BLOWER ASSEMBLY.

4. Remove dowels from blower mounting flange and blower support.
5. Remove housing mounting bolts and slide housing out of the way.

NOTE: Mark the shims removed so they may be placed in their original positions when gear unit is reinstalled on blower.

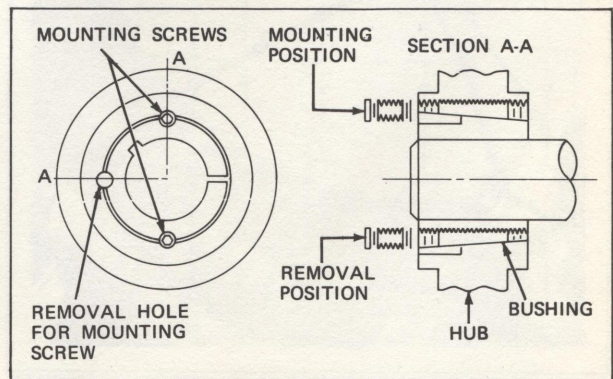


FIG. V-26. TAPER LOCK HUB AND BUSHING.

Installation

With gear unit installed and aligned with compressor and/or engine, proceed as follows:

1. Be sure the blower support is free of dirt and oil by cleaning with safety solvent (mineral spirits D-588).
2. If seals on blower support are damaged, replace them by activating the adhesive on new seals using safety solvent, and apply the new seals to blower support.
3. Position the blower housing, aligning the dowel holes and replacing the shims in their original positions, on the blower support. Align the 5.50-in. diameter opening in the housing with the fan gear-unit shaft to within ± 0.60 in. on the radius.
4. Align the inlet side of the blower housing to within 17.030-16.970 in. vertical and horizontal to the end of the shaft using sweep tool, Figs. V-27 and V-28.
5. Bolt housing in place. Torque mounting bolts to 180-215 lb.-ft.
6. Assemble rotor as follows:
 - a. Clean fan gear-unit shaft, key and fan hub bore with mineral spirits. Make sure cleaner is completely removed before assembly. Polishing the surfaces with clean paper towels is recommended.
 - b. Insert bushing in hub, matching the half holes.

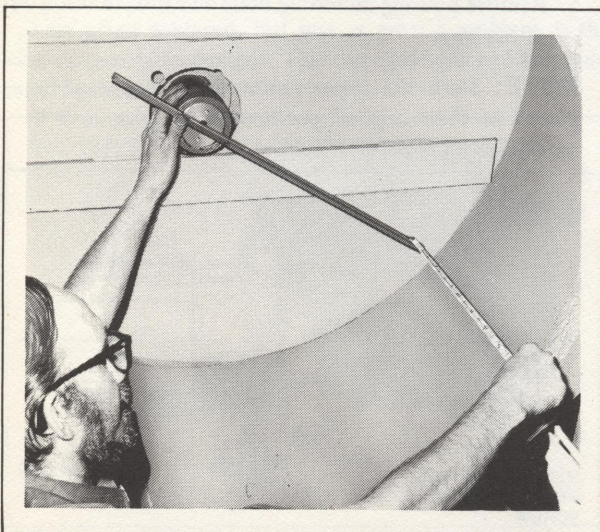


FIG. V-27. MAKING SWEEP TOOL MEASUREMENT.

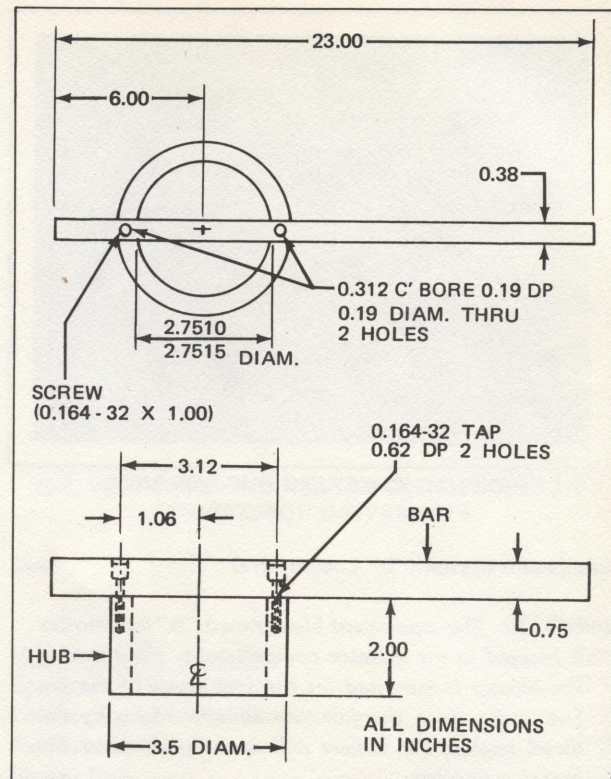


FIG. V-28. SWEEP TOOL.

- c. Coat set screws with oil and insert them loosely in the two holes that are threaded in the hub-side of the hole.
- d. Slip the fan assembly onto the shaft with the key in the keyway.
- e. Tighten the bushing screws alternately to 800 lb.-in. torque. The hub face should be flush with the shaft end within 0.02 in.
- f. Hammer against large end of bushing using a hammer and brass block or sleeve to avoid damage. Retorque screws. Repeat this alternate hammering and screw tightening until the specified wrench torque no longer turns the screws. Fill other holes with grease to exclude dirt.
7. Replace the inlet cone. Use caulking between housing and cone. Adjust cone so the dimensions between the rotor and cone, Fig. V-25, are met. Tighten the sixteen nuts.
8. Replace the inlet guard, using caulking between cone and guard and tighten the six bolts.
9. After alignment, drill and ream two holes 0.500 in. through No. 2 end of blower mounting flange and blower support. Insert new dowel pins.

FIG. V-27, E-24584

FIG. V-28, E-24585

CAB HEATER

DESCRIPTION

The cab heater is a self-contained unit for electrically heating the locomotive cab located in the short hood. The cabinet houses the heating elements, the motor and blower, the overheat switches and terminals for external power connections. Cab air enters the unit through the lower opening in the cab front wall, flows through the blower and is returned over the heating elements to the cab through the upper opening. Clean air from the platform air duct, controlled by a Fresh Air lever, Fig. V-29, on the left-side of the heater, may also be introduced into the heater air chamber.

This heater has five heating elements capable of delivering 11.25 kw of heat. The overheat switch, which is manually reset by pressing a red button on top of the switch, can be reached through the hinged access door on the left-side of the heater, Fig. V-30. To prevent overheating the cab, a return air thermostat which opens at 100 F and resets automatically at 90 F, is incorporated in the electrical circuits.

The heater operates on 74 vdc. The heating elements are rated at 2250 w at 74 v. The two-speed blower motor is rated at 0.167/0.220 hp, 860/1160 rpm, 3 or 4 amps. at 74 vdc. Motor speed is varied by switching a 100-ohm, 100-w field resistor.

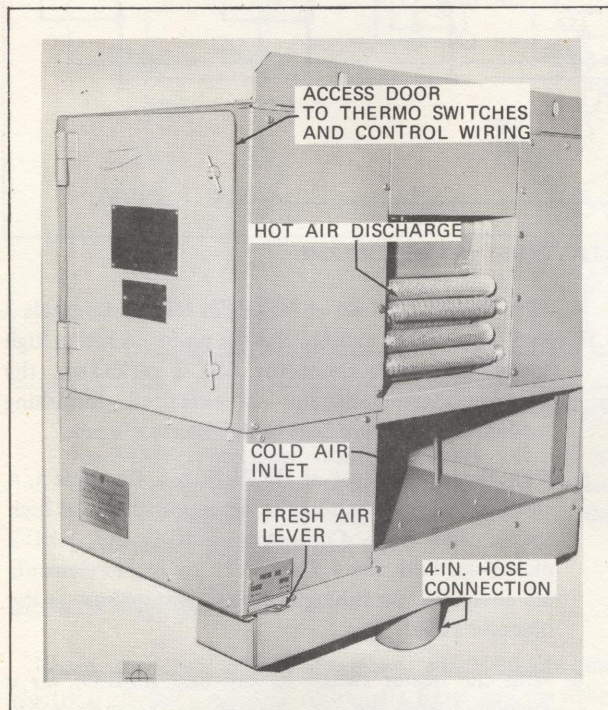


FIG. V-29. HEATER AIR INLETS AND OUTLETS.

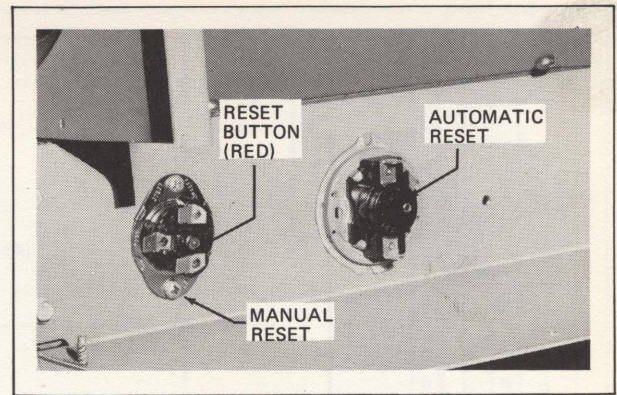


FIG. V-30. TOP REMOVED SHOWING THERMO SWITCHES.

ELECTRICAL CIRCUITS

Because of several modifications to the original heater, attention is called to the necessity of working with the correct circuit diagram in connecting or servicing the heater.

NOTE: If the heater circuits match Figs. V-31 and V-32, contact the GE serviceman for the necessary equipment to up-date the heater to the latest schematic diagram, Fig. V-33.

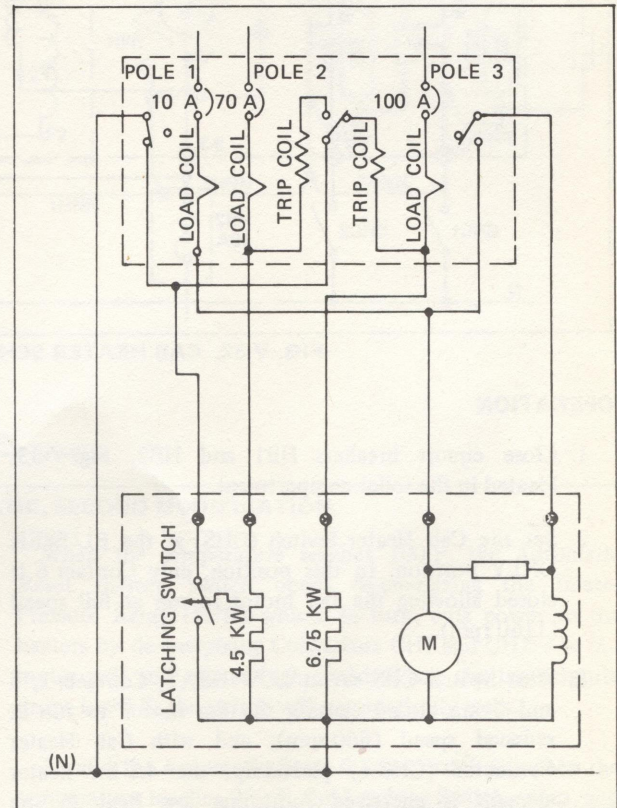


FIG. V-31. ORIGINAL WIRING.

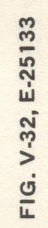


FIG. V-32. CAB HEATER SCHEMATIC, FIRST MODIFICATION.

OPERATION

4. With Switch CHS set at MEDIUM HEAT, Contacts 3 and 6 are closed causing the fan motor to run at high speed; and with Contactor CHC-2 picked-up, the 6.75 kw heater element is energized furnishing medium temperature heat to the operator's cab.
5. With Switch CHS set at HIGH HEAT, Contacts 3, 4 and 6 are closed, causing the fan motor to run at high speed; and with Contactors CHC-1 and CHC-2 picked-up, both the 4.5 and 6.75 kw heater elements are energized, furnishing high temperature heat to the operator's cab.
6. With the heater switch in any heat position, air is circulated from the cab, through the heater back into the cab. If outside air is desired, a small lever,

FIG. V-33, E-25134

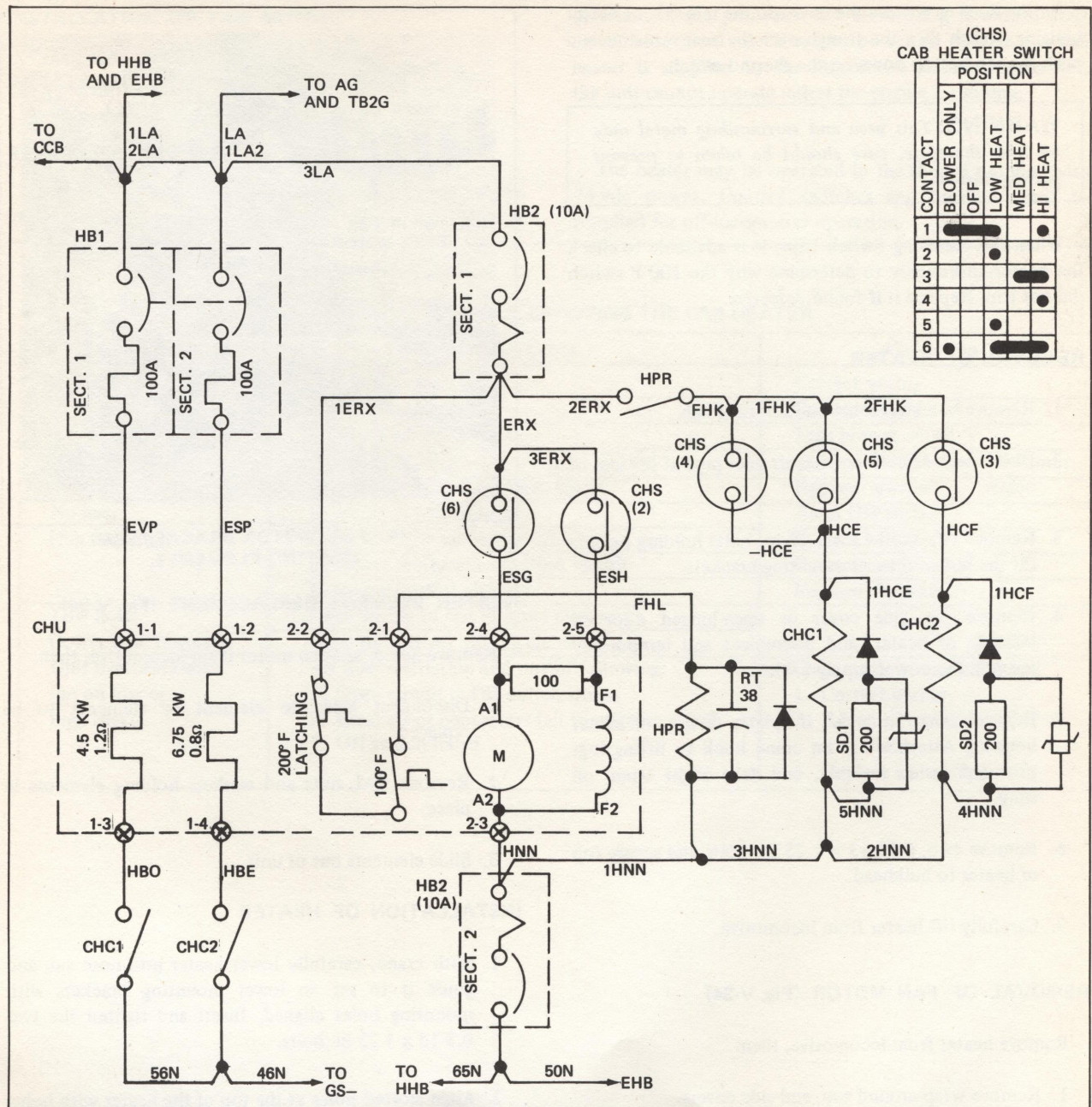


FIG. V-33. CAB HEATER SCHEMATIC, SECOND MODIFICATION.

Fig. V-29, protruding from the lower left-side of heater, must be moved to the right to open a holed slide allowing cleaned, outside air to mix with the inside air for maximum heat flow.

SAFETY DEVICES

There are two thermo switches, Fig. V-30, in the electrical circuits; one with Automatic Reset and the other a Manual Reset switch.

When the temperature reaches 100 F, the Automatic Reset thermo switch opens de-energizing the Heater Pressure Relay (HPR) which, in turn, cuts power to the heaters by de-energizing Contactors CH1 and CH2. The fan motor will still run at high speed. When the temperature drops to 90 F, the switch will automatically reset.

Should the Automatic Reset thermo switch fail when the temperature reaches 200 F, the Latching Switch opens, and again power is cut-off to the heaters. To reset this switch,

open the door or remove the cover on the left-side of heater housing. Reach thru the trough over the heat elements and push the red button down on the thermo switch.

WARNING: *This area and surrounding metal may be hot; therefore, care should be taken to prevent getting burned.*

When this Latching Switch trips, it is advisable to check the heater thoroughly to determine why the 100 F switch did not trip. Replace it if found defective.

REMOVAL OF HEATER

1. Remove hatch on short hood or nose cab.
2. Disconnect 4-in. hose from air inlet pipe at bottom of heater.
3. Remove two 0.50-13 x 1.25-in. bolts holding heaters (at the bottom) to its mounting brackets.
4. Remove top side cover or open-hinged door on left-side of heater, and disconnect and temporarily insulate the power supply cables.
5. Remove two, 5.5 x 5.5 in. plates on top of heater housing. Attach slings on crane hook to lifting lugs provided inside housing, and take slight strain on sling.
6. Remove two, 0.50-13 x 1.25 in. bolts and secure top of heater to bulkhead.
7. Carefully lift heater from locomotive.

REMOVAL OF FAN MOTOR (Fig. V-34)

Remove heater from locomotive, then:

1. Remove wrap-around top, end-side covers.
2. Loosen or remove the set screw holding the fan on the motor shaft.
3. Disconnect motor leads at motor.
4. Remove six mounting screws holding motor mount to heater housing. Pull motor from unit; fan will remain in unit.
5. Loosen bolts in mounting bracket band and remove motor from mounting bracket.

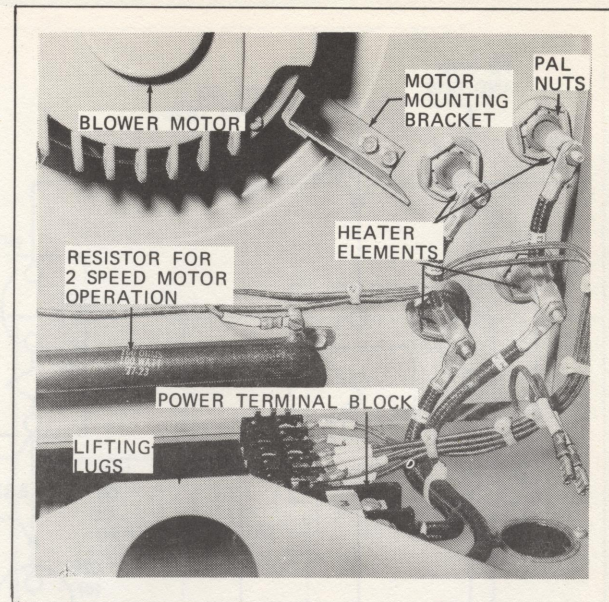


FIG. V-34. MOTOR BRACKET AND HEATING ELEMENTS.

HEATER ELEMENT REPLACEMENT (Fig. V-34)

Remove heater and fan motor from locomotive, then:

1. Disconnect leads to element or elements to be replaced.
2. Remove PAL nuts and washers holding elements in place.
3. Slide elements out of unit.

INSTALLATION OF HEATER

1. With crane, carefully lower heater into nose cab and guide it to set on lower mounting brackets with mounting holes aligned. Insert and tighten the two 0.5-13 x 1.25 in. bolts.
2. Align slotted holes at the top of the heater with holes in bulkhead. Insert and tighten 0.5-13 x 1.25 in. bolts.
3. Insert power cables into heater and connect per schematic diagram.
4. Remove sling. Replace all covers previously removed.
5. Reconnect 4-in. air intake hose at bottom of heater.
6. Reinstall nose cab hatch.

INSTALLATION OF FAN MOTOR

Reverse the removal procedure.

INSTALLATION OF HEATER ELEMENT

Reverse steps in removal of elements.

TROUBLE-SHOOTING

Use of the trouble-shooting table (Table V-I) will help to identify possible causes of trouble. Once the cause is

determined, the procedure for eliminating it will, in most cases, be evident. Because the power to operate the cab heater is supplied by the locomotive auxiliary generator, the unit cannot operate unless the engine is running.

The heater may be operated in the shop if supplied with 74 vdc power. Control switches and breakers must be supplied for off-locomotive operation.

TABLE V-I, TROUBLE-SHOOTING THE CAB HEATER

Problem	Possible Cause	Correction
Fan won't run.	Fan motor circuit open	Correct wiring
	Motor brushes faulty	Replace brushes.
	Blower wheel blocked	Free blower wheel.
Fan speed excessive.	Open field circuit	Correct circuit or replace motor.
	Open resistor (if set on high speed)	Replace resistor.
No heat (fan running).	Overheat switch tripped	Reset OH switch.
	Open wiring in heater circuit	Correct wiring.
	Defective fan/heater interlock circuit	Correct circuit.
	Defective heating elements	Replace elements.
Low heat (lower than normal).	Open wiring to one or more elements	
	Open (defective) heating element.	
Unit overheats with fan on low or high speed.	Air flow restriction and one of following: 1. Open circuit in OH switch wiring 2. Breakers or contactors fail to open on signal 3. OH switch failed	Clear air flow restriction and: 1. Correct wiring 2. Repair or replace breaker or contactor 3. Replace OH switch.